

A REVISION AND TAXOMETRIC ANALYSIS OF THE
GENERA *SPHAEROGASTRELLA* DUDA AND
LIODROSOPHILA DUDA OF THE WORLD
(Diptera, Drosophilidae)

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Sphaerogastrella Duda and *Liodrosophila* Duda are closely related genera of the subfamily Drosophilinae, having features in common as below according to Duda (1922: 153) and Wheeler and Takada (1964: 222). Body usually glossy black. Frontal shield well demarcated from parafrontalia. Lunular bristles reduced. Fore femur usually with a row of setulae inside. Anal vein reduced. Male genitalia small, concealed. Ovipositor pointed.

There have been known a single species of *Sphaerogastrella* and 21 species of *Liodrosophila* to have nomenclaturally valid names, recorded mostly from the Oriental Region and none from the new world.

Liodrosophila australis Malloch, 1928, and *L. flavipes* Harrison, 1954, were moved to *Lissocephala* Malloch implicitly by Harrison (1954: 114) and to *Drosophila* Fallén explicitly by Wheeler and Kambyzellis (1966: 536), respectively.

Through examination of a large number of specimens, some new species are described, some known species are redescribed, and the relationships of these genera and species are taxometrically analysed in the present study. The types of new species are deposited at the National Science Museum, Tokyo.

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kyo Metropolitan University, and myself (S. E. Asia, Madagascar, 1971)*; Dr. K. Wakahama, Shimane University (S. E. Asia, 1971); Mr. O. Yata, Kyushu University (Malaya, 1973); Mr. N. Watanabe, Tokyo Metropolitan University (Ryukyus, 1973); Dr. S. Shinonaga, Tokyo Medical and Dental University, and Dr. H. Kurahashi, National Institute of Health (Celebes, Lombok, 1973).

Explanation of special technical terms used in the text: Cheek width: the widest width in lateral view of cheek, usually at the caudal angle, in comparison to the greatest diameter of eye. Wing indices: C-index, length second costal section in proportion to length third costal section; 4V-index: length distal section of M in proportion to length part of M between crossveins; 4C-index: length third costal section in proportion to length part of M between crossveins; 5x-index: length distal section of Cu in proportion to length posterior crossvein; Ac-index: length third costal section in proportion to length fourth costal section. 3C fringe: range of costal portion with heavy bristles on the third costal section. PI: phallosomal index, length aedeagus in proportion to length its apodeme.

Genus *Sphaerogastrella* Duda

Sphaerogastrella Duda, 1922. Arch. Naturg. 88A4: 158. Type species, *Camilla javana* de Meijere, monotypy. — 1924. Arch. Naturg. 90A3: 190.

Diagnosis. Abdomen spherical in dorsal aspect, much broader than thorax. Postverticals, inner verticals, acrostichal hairs, humerals, notopleurals, and sternopleurals absent.

Sphaerogastrella javana (de Meijere) Figs. 1, 2

Camilla javana de Meijere, 1911. Tijdschr. Ent. 54: 422 (Java).

Sphaerogastrella javana: Duda, 1922. Arch. Naturg. 88A4: 159 (Vietnam). — 1926. Supplta. Ent. 14: 53 (Sumatra).

Sphaerogastrella javana var.: de Meijere, 1924. Tijdschr. Ent. 67 (Suppl.): 62 (Sumatra).

Camilla flavipes de Meijere, 1915. Tijdschr. Ent. 58: 95 (Sumatra) (nom. nud. syn. teste Duda, 1922, op. cit.: 158).

Diagnosis. Eye bare. Periorbit broad, reaching anterior margin of front. Front smooth. Scutellum velvety black.

♂♀. Periphallie organs (Fig. 1): Generally black. Lower tip of epandrium and surstylus paler. Both epandrium and cercus without microtrichia, but with long hairs. Surstylus with about 9 teeth in a slightly concaved row. Phallic organs (Fig. 2): Aedeagus fusiform, with hyaline rounded flap marginally, apodeme short but broad. PI=3.0. Hypandrium bare, with ventral fragma prox-

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imally rounded, submedian spine minute. Paramere small, fused with hypandrium, with about 2 minute sensilla. Ovipositor yellow, fusiform and apically pointed as in *Liodrosophila* species, with about 19 marginal and 7 long upper teeth.

Egg about 0.5 mm in length, with four subequal filaments, which are slightly shorter than egg.

Specimens examined. THAILAND, Kaeng Khoi, 1 ♂, 16. VIII. 1971 (Okada). MALAYA, Penang, 1 ♂, 23. X. 1969 (Hasegawa). JAVA, Tugu, 9 ♂, 11 ♀, 27-30. VII. 1971; Bogor, 8 ♂, 6 ♀, 27. VII. 1971; Tjibodas, 1 ♂, 28. VII. 1971 (Ikeda, Kurokawa, Okada). SINGAPORE, Botanical Garden, 2 ♂, 3 ♀, 16. VII. 1971; University campus, 1 ♂, 1 ♀, 6. VIII. 1971 (Okada, Ikeda). SUMATRA, Pekanbaru, 3 ♂, 7 ♀, 2-4. VIII. 1971 (Okada). CEYLON, Kandy, 3 ♂, 2 ♀, 18-20. VIII. 1971; Peradeniya, 23 ♂, 20 ♀, 17-19. VIII. 1971 (Ikeda, Kurokawa, Okada). LOMBOK, Suranadi, 3 ♂, 21. XII. 1973 (Shinonaga).

Distribution. Thailand (n. loc.), Vietnam, Malaya (n. loc.), Java, Sumatra, Singapore (n. loc.), Lombok, (n. loc.), Ceylon (n. loc.).

***Sphaerogastrella rostralis* n. sp. Figs. 3, 4.**

Diagnosis. Eye bare. Periorbit broad, reaching anterior margin of front. Front very finely punctured. Scutellum granulose. Aedeagus ventromedially with a beak-like process, thus the specific name.

♂. Body glossy deep black, about 2.5 mm in length. Head nearly as broad as thorax. Eye brownish black, bare. Antenna with 2nd joint brown, 3rd black. Arista with about 5 upper and 3 lower branches besides a large fork. Palpus black, slender. Clypeus brownish black. Periorbit brownish black, broad, reaching anterior margin of front. Front glossy dark brown, very finely punctured. Face dark brown. Carina high, broad, laterally ridged. Cheek dark brown, 1/5 as broad as eye diameter. Orbitals widely apart from each other, anterior reclinate minute, slightly nearer proclinate than posterior reclinate.

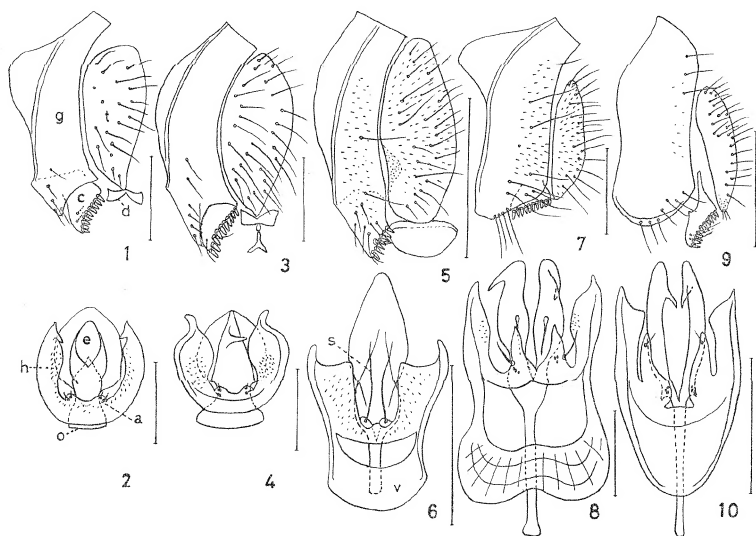
Mesoscutum glossy deep black. Scutellum mat granulose black, caudal end truncate. Anterior scutellars 1/5 as long as posteriors, which are nearer anteriors than each other. Legs yellow, coxae and trochanters black, fore femur with a row of setulae. Wings hyaline, R_{2+3} nearly straight. C-index 2.0, 4V-index 1.5, 5x-index 1.2, Ac-index 3.0, 3C fringe 1/3. Haltere yellowish grey. Abdominal tergites deep glossy black.

Periphallic organs (Fig. 3): Epandrium and cercus brownish black, without microtrichia. Surstylus paler, with about 10 teeth arranged in a slightly concaved row. Phallic organs (Fig. 4): Aedeagus fusiform, laterally with hyaline rounded flaps, medioventrally with a large pointed process. Apodeme of aedeagus broad and short. $PI = 2.0$. Hypandrium pubescent, submedian spine minute.

Specimens examined. THAILAND, Kaeng Khoi, 2 ♂ (incl. Holotype), 10. VIII. 1971 (Okada).

Relationships. Different from *S. javana* (de Meijere) in having finely punctured front, granulose scutellum, and beak-like process of aedeagus.

Distribution: Thailand.



Figs. 1-10. Peripheral (upper) and phallic (lower) organs. 1, 2. *Sphero-gastrella javana* (de Meijere) from Java; 3, 4. *S. rostralis* n. sp. from Thailand; 5, 6. *Liodrosophila coeruleifrons* (de Meijere) from Java; 7, 8. *L. ornata* n. sp. from Ceylon; 9, 10. *L. quadrimaculata* n. sp. from Taiwan. a. paramere, c. surstylus, d. decasternum, e. aedeagus, g. epandrium, h. hypandrium, o. apodeme of aedeagus, s. submedian spine of hypandrium, t. cercus, v. ventral fragma of hypandrium. Scales 0.1 mm.

Genus *Liodrosophila* Duda

Liodrosophila Duda, 1922. Arch. Naturg. 88 A4: 153. Type species, *Camilla coeruleifrons* de Meijere, by designation of Okada, 1956. Syst. Study Dros. Jap.: 57. — Duda, 1924. Arch. Naturg. 90A3: 190. — Harrison, 1954. Trans. R. ent. Soc. Lond. 105: 113. — Wheeler and Takada, 1964. Ins. Micronesia, 14(6): 222.

Diagnosis. Body usually glossy black. Frontal shield well demarcated from parafrontalia. Postverticals and anterior reclinate orbitals minute. Palpus with a long apical seta. Fore femur usually with a row of setulae inside. Abdomen as broad as thorax. Ovipositor pointed apically. (after Duda, 1922; Wheeler and Takada, 1964).

Liodrosophila coeruleifrons (de Meijere)

Figs. 5, 6

Camilla coeruleifrons de Meijere, 1911. Tijdschr. Ent. 54: 421 (Java) — 1918 Tijdschr. Ent. 60: 345 (Java).

Liodrosophila coeruleifrons: Duda, 1922. Arch. Naturg. 88A4: 155 (Java).

Diagnosis. Periorbit broad. Frontal shield much broader than long, granulose, green. Acrostichal hairs in 2 rows.

♂, ♀. Body about 1.5 mm in length. Eye sparsely piled. Head broader than thorax. Antenna with 2nd joint orange, 3rd brownish black. Proclinate orbitals as long as posterior reclinate. Second oral fine. Humeral 2, lower longer. Mesoscutum granulose, black, with golden pruinosity. Acrostichal hairs in 2 rows. Scutellum granulose, black, with golden pruinosity. Anterior scutellars 1/3 as long as posteriors. Legs black, paler distally, fore coxa much swollen vertically. Wings hyaline, 3C fringe 4/7. Haltere orange yellow.

Periphallic organs (Fig. 5): Generally pale brown. Epandrium with microtrichia, fused with surstylus, which has about 7 teeth in a straight row. Cercus with microtrichia. Phallic organs (Fig. 6): Generally dark brown. Aedeagus slender, fusiform. Hypandrium pubescent, with long submedian spine. Ventral fragma quadrate. Ovipositor dark brown, with about 12 marginal and 4 long upper teeth.

Egg about 0.5 mm in length, with 4 filaments. Posterior pair of filaments slightly longer than anterior and slightly shorter than egg itself.

Specimens examined. MALAYA, Kuala Lumpur, 1♀, 20-22. VII. 1971 (Kurokawa, Ikeda); Penang, 3♂, 4♀, 20. VII. 1971 (Okada); Ululanga, 4♂, 1♀, 4. VIII. 1973 (Yata). JAVA: Bogor, 10♂, 24♀, 27. VII. 1971; Tugu, 8♂, 21♀, 27-30. VIII. 1971; Tjibodas, 1♂, 4♀, 28. VIII. 1971 (Ikeda, Kurokawa, Okada). SARAWAK, Kuching, 1♀, 7. VI. 1971 (Kitagawa). BRUNEI, Brunei Town, 4♂, 3. VI. 1971 (Kitagawa). CELEBES, Bantimurung, 28. XII. 1973 (Kurahashi). LOMBOK, Suranadi, 1♀, 21. XII. 1973 (Shinonaga).

Distribution. Malaya (n. loc.), Java, Brunei (n. loc.), Sarawak (n. loc.), Celebes (n. loc.), Lombok (n. loc.).

Liodrosophila ornata sp. n. Figs. 7, 8

Diagnosis. Eye with piles. Periorbit broad. Front granulose, subshining black. Mesoscutum finely granulose, pubescent. Wing with dark markings, thus the specific name.

♂, ♀. Body about 2.2 mm in length, deep subshining black. Eye dark red, with piles. Antenna black, arista with 3-4 upper and 2 lower branches besides a large fork. Palpus black. Clypeus glossy black. Periorbit broad, but not reaching anterior margin of front. Front granulose, subshining black. Face glossy black, carina well developed. Cheek deep black, 1/4 as broad as eye diameter. Proclinate orbital half as long as posterior reclinate. Second oral 1/3 as long as vibrissa.

Mesoscutum subshining deep black, finely granulose, and finely pubescent. Thoracic pleura black. Scutellum deep black, pubescent. Humeral 2, upper longer. Acrostichal hairs in 2 rows. Anterior scutellars 1/3 as long as posteriors, which are twice apart from each other as from anteriors.

Fore leg subshining deep black except tarsi which are pure white, mid and hind legs yellowish brown. Wings dark with white patches around R_{4+5} , anterior crossvein, and posterior crossvein including distal section of Cu, and below proximal section of Cu. R_{2+3} straight. C-index 2.0, 4V-index 2.2, 4C-index 1.3, 5x-index 2.7, Ac-index 2.7, 3C fringe 5/7. Haltere orange yellow. Abdominal tergites glossy black.

Periphallic organs (Fig. 7): Epandrium and cercus dark brownish black, thickly pubescent. Surstylus with about 10 teeth in a straight row. Phallic organs (Fig. 8): Generally black. Aedeagus paired, each lobe with a dorsally recurved apical claw. Hypandrium finely pubescent, with moderate submedian spine. PI=1.0. Ventral fragma quadrate. Ovipositor dark brown, with about 15 marginal and 5 long upper teeth.

Specimens examined. CEYLON, Peradeniya, 4 ♂ (incl. Holotype), 1 ♀, 17-19. VIII, 1971 (Ikeda, Kurokawa, Okada).

Distribution. Ceylon.

Relationships. Resembling *L. bimaculata* Okada from Nepal in having pictured wing and roughly granulose front, but differs in having 2 rows of acrostichal hairs (6 in *bimaculata*), white fore tarsi (black in *b.*), and paired aedeagus (single in *b.*).

***Liodrosophila quadrimaculata* n. sp. Figs. 9, 10**

Diagnosis. Eye with piles. Periorbit broad, reaching anterior margin of front. Front roughly granulose. Mesoscutum black and with fine microtrichia. Wing pictured with 4 black patches, thus the specific name.

♂. Body about 2.0 mm in length. Head nearly as broad as thorax. Eye dark red, with sparse piles. Antenna black, arista with 3 upper and 2 lower branches besides a large fork. Palpus black. Clypeus greyish black. Periorbit broad, reaching anterior margin of front. Frontal shield quadrate, longer than broad, roughly granulose subshining black. Face black. Carina high, half as long as front, laterally ridged. Cheek black, 1/4 as broad as eye diameter. Proclinate orbital 2/3 as long as posterior reclinate, anterior reclinate nearer proclinate than posterior reclinate. Second oral fine.

Mesoscutum, scutellum, and thoracic pleura granulose, mat black, and pubescent. Humeral one. Acrostichal hairs in 2 (?) rows. Anterior scutellars much shorter than posteriors, about 1/3 as long as posteriors: posteriors nearer anteriors than each other. Legs yellowish white, fore and mid coxae black, fore femur black at distal half. Wing with four large black patches, one largest on distal half, one on each side of anterior crossvein, and one below Cu. R_{2+3} gently curved to costa. C-index 3.0, 4V-index 3.5, 4C-index 1.5, 5x-index 2.0, Ac-index 2.5, 3C fringe 2/5. Haltere brownish black. Abdominal tergite brown, with obscure dark contiguous caudal cross band.

Periphallic organs (Fig. 9): Generally brownish black. Epandrium with sparse microtrichia, cercus without microtrichia. Surstylus with about 10 teeth in a straight row. Phallic organs (Fig. 10): Generally black. Aedeagus pair-

ed, each lobe apically with dorsally recurved claw. $PI=1.0$. Hypandrium bare, with short submedian spine. Ventral fragma rounded.

Specimen examined. TAIWAN, Chitou, 1 ♂ (Holotype), 16. VIII, 1967 (Throckmorton).

Distribution. Taiwan.

Relationships. Resembling the foregoing species, *L. ornata*, in having granulate front, pictured wing, and clawed bifid aedeagus, but distinguished in having dark markings of wing not covering apex, and C- and 4V-indices higher.

Liodrosophila sinuata n. sp. Figs. 11, 12

Diagnosis. Eye pubescent. Periorbit and parafrontalia broad. Front and mesoscutum granulate. Acrostichal hairs in 2 rows. Wing pictured, R_{2+3} strongly sinuated, thus the specific name, M curved caudally.

♂, ♀. Body about 2.2 mm in length. Head slightly broader than thorax. Eye dark red, with piles. Antenna brown, arista with 5-6 upper and 4 lower branches besides a large fork. Palpus black. Periorbit black, broad. Parafrontalia very broad. Frontal shield granulate, black. Face black, paler below. Carina low but broad. Cheek narrow. Proclinate orbital slightly shorter than posterior reclinate. Second oral minute.

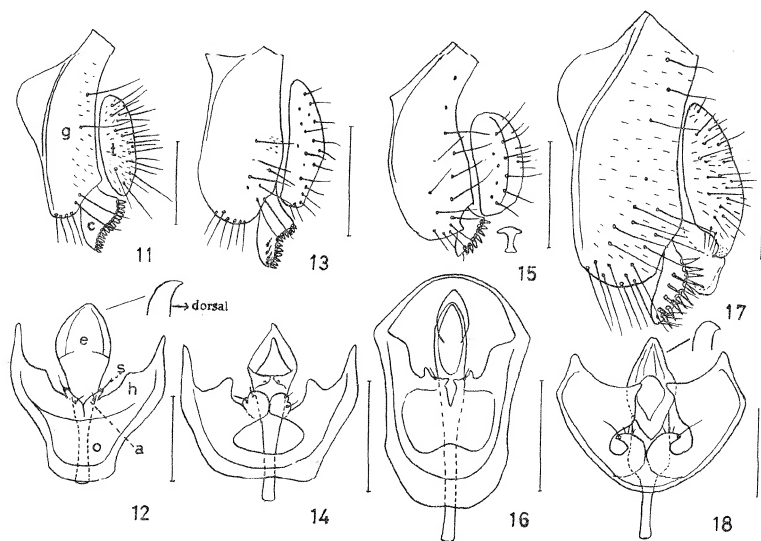
Mesoscutum granulate, mat black, Scutellum velvety black. Thoracic pleura black. Humeral one. Acrostichal hairs in 2 rows. Scutellars subequal in length and equally apart. Legs yellowish brown, mid and hind coxae white, femora distally dark. Male fore tarsi with long non-recurved hairs along anterior margin. Wing with seven black patches, two in cell R_{2+3} , one around anterior crossvein, two below R_{4+5} , one outside posterior crossvein, and one in cell Cu. R_{2+3} strongly sinuated, Cu curved caudally to become much divergent from R_{4+5} . C-index 1.5-2.0, 4V-index 1.5-2.0, 4C-index 1.5-2.0, 5x-index 1.0-1.5, Ac-index 1.5-2.0, 3C fringe 1/2. Haltere brown. Abdominal tergites glossy black.

Periphallic organs (Fig. 11): Generally pale yellowish brown. Epandrium and cercus with microtrichia. Surstylus with about 16 teeth in a slightly sinuated row. Phallic organs (Fig. 12): Generally pale yellowish brown. Aedeagus hexagonal in ventral aspect. $PI=1.0$. Hypandrium bare, with minute submedian spine. Ovipositor yellowish brown, with about 15 marginal and 3 upper teeth.

Specimens examined. MADAGASCAR; Perinet, 13 ♂ (incl. Holotype), 16 ♀, 10. IX. 1971; Tananarive, 2 ♂, 1 ♀, 1-2. IX. 1971; Manjakarina, 1 ♂, 10. IX. 1971 (Ikeda, Kurokawa, Okada).

Distribution. Madagascar.

Relationships. Resembling *L. quadrimaculata* in having pictured wing and granulate front and mesoscutum, but distinguished in having R_{2+3} strongly sinuated and M divergent from R_{4+5} .



Figs. 11-18. Peripheral (upper) and phallic (lower) organs. 11, 12. *Liodrosophila sinuata* n. sp. from Madagascar; 13, 14. *L. madagascarenensis* n. sp. from Madagascar; 15, 16. *L. divergens* n. sp. from Madagascar; 17, 18. *L.* sp. 1 from Taiwan; Signs and scales as in Figs. 1-10.

***Liodrosophila divergens* n. sp. Figs. 15, 16**

Diagnosis. Body black. Eye with piles. Periorbit broad. Front smooth. Mesoscutum nearly smooth. Acrostichal hairs in 6 rows. Wing with R_{4+5} and M much divergent, thus the specific name.

♂, ♀. Body about 1.7 mm in length. Head slightly broader than thorax. Eye dark red, with piles. Antenna orange brown, arista with 5 upper and 3 lower branches besides a large fork. Palpus yellowish brown. Clypeus black. Parafrontalia glossy brownish black, broad. Frontal shield glossy brownish black, anteriorly orange brown. Face brown, carina grey half, as long as face. Procline orbital slightly shorter than posterior reclinate. Second oral very fine.

Mesoscutum subshining black, nearly smooth. Scutellum velvety black. Thoracic pleura slightly paler than mesoscutum. Humerals 2, lower longer. Acrostichal hairs in 6 rows. Posterior scutellars as long as anteriors, equally apart from anteriors and each other. Legs yellowish brown, mid and hind femora mostly dark brown, male fore tarsi with long recurved hairs along dorsal surface. Wing hyaline, R_{2+3} nearly straight, R_{4+5} and M much divergent. C-index 1.5, 4V-index 2.0, 4C-index 1.5, 5x-index 1.8, Ac-index 2.5, 3C fringe 1/2.

Haltere yellowish grey. Abdominal tergites glossy black, basal segment mat greyish black or yellowish grey.

Periphallic organs (Fig. 15): Generally yellowish brown. Epandrium and cercus without microtrichia. Surstylus with about 10 teeth in a straight row. Phallic organs (Fig. 16): Generally pale yellowish brown. Aedeagus fusiform, $PI=0.7$. Hypandrium bare, with small submedian spine inserted on small conical process. Ventral fragma quadrate. Ovipositor pale yellow, with about 16 marginal and 4 upper longer teeth.

Specimens examined. MADAGASCAR, Perinet, 1 ♂ (Holotype), 6 ♀, 19. IX. 1971; Tananarive, 1 ♂, 1-2. IX. 1971 (Ikeda, Kurokawa, Okada).

Distribution. Madagascar.

Relationships. Somewhat related to the foregoing species, *L. sinuata*, in having much divergent R_{4+5} and M and very broad parafrontalia, but distinguished in having entirely hyaline wing and nearly smooth front and mesoscutum.

***Liodrosophila madagascarensis* n. sp.** Figs. 13, 14

Diagnosis. Body black. Eye with piles. Parafrontalia broad. Frontal shield glossy brownish black, anteriorly orange. Mesoscutum nearly smooth. Acrostichal hairs in 6 rows. R_{4+5} and M parallel. Basal abdominal tergites yellow.

♂, ♀. Body about 1.7-2.0 mm in length. Head slightly broader than thorax. Eye finely pilose. Antenna orange brown, arista with 5-6 upper and 2 lower branches beside a moderate fork. Palpus brown. Clypeus brown. Front glossy brownish black, anteriorly orange. Parafrontalia broad. Face brown, carina broad and long. Cheek yellowish brown, narrow. Procline orbital 2/3 as long as posterior reclinate. Second oral fine.

Mesoscutum and thoracic pleura glossy black, nearly entirely smooth. Scutellum velvety black. Humerals 2, lower longer. Acrostichal hairs in 6 rows. Anterior scutellars divergent, as long as posteriors, which are equally apart from anteriors and from each other. Legs yellowish brown, fore and mid femora black. Distal half of hind femur brownish black, proximal half white. Hind coxa white. Male fore tarsi with long recurved hairs along dorsal surface. Wing hyaline, R_{2+3} slightly curved to costa, R_{4+5} and M parallel. C-index 2.5, 4V-index 2.0, 4C-index 1.0, 5x-index 2.0, Ac-index 2.5, 3C fringe 2/5. Haltere yellow. Abdominal tergites glossy black, 1-3 tergites yellow at least medially.

Periphallic organs (Fig. 13): Epandrium black, lower tip yellow, without microtrichia. Cercus without microtrichia. Surstylus brown, with about 13 teeth in a concaved row. Phallic organs (Fig. 14): Generally brown. Aedeagus fusiform. Hypandrium bare, laterally convexed, with short submedian spine inserted on small rounded process. Ovipositor brown, with about 14 marginal and 4 longer upper teeth.

Specimens examined. MADAGASCAR, Tananarive, 22 ♂ (incl. Holotype), 10 ♀, 1-2. IX. 1971; Perinet, 1 ♂, 7 ♀, 19. IX. 1971 (Ikeda, Kurokawa, Okada).

Distribution. Madagascar.

Relationships. Somewhat resembling the foregoing species, *L. divergens*, in having broad parafrontalia, smooth and anteriorly orange frontal shield, but distinguished in having R_{4+5} and M parallel and C-index higher.

***Liodrosophila rugulosa* (de Meijere) Figs. 19, 20**

Camilla rugulosa de Meijere, 1914. Tijdschr. Ent. 57: 269 (Java).—1918. Tijdschr. Ent. 60: 345 (Java).

Liodrosophila rugulosa: Duda, 1922. Arch. Naturg. 88A4: 156 (Java).

Not *Liodrosophila rugulosa*: Okada, 1965. Kontyû, 33: 336 (Ryukyus).—1968. Kontyû, 36: 330 (Ryukyus) (misidentified).

Diagnosis. Periorbit narrow. Front longitudinally shrinked. Mesoscutum roughly granulose. Acrostichal hairs in 6 rows. Hind femur proximally white, distally black.

♂, ♀. Body about 1.5 mm in length. Head slightly broader than thorax. Eye dark red, with piles. Palpus brownish black. Periorbit glossy deep black, anteriorly narrow. Clypeus glossy black. Front deep bluish black, granulose, with longitudinal shrinks.

Mesoscutum brownish black, roughly granulose. Scutellum velvety black. Humerals 2. Acrostichal hairs in 6 rows. Anterior scutellar half as long as posteriors, which are nearer anteriors than each other. Wing hyaline, R_{2+3} slightly curved to costa apically. C-index 1.5, 4V-index 2.2, 4C-index 1.5, 5x-index 1.8, Ac-index 4.3, 3C fringe 1/2. Haltere black, apically yellow.

Periphallic organs (Fig. 19): Epandrium brownish black, cercus paler, both without microtrichia. Surstylus with about 10 teeth in a concaved row. Phallic organs (Fig. 20): Generally brownish black. Aedeagus fusiform. Hypandrium bare, with fine submedian spine on small conical process. PI=1.5. Ventral fragma rounded. Ovipositor pale yellow, with about 13 marginal and 3 upper longer teeth.

Specimens examined. JAVA, Tugu, 12 ♂, 8 ♀, 27-30. VIII. 1971; Tjibodas, 6 ♂, 10 ♀, 28. VIII. 1971; Bogor, 1 ♂, 1 ♀, 27. VIII. 1971 (Ikeda, Kurokawa, Okada).

Distribution. Java.

***Liodrosophila aerea* Okada Figs. 21, 22**

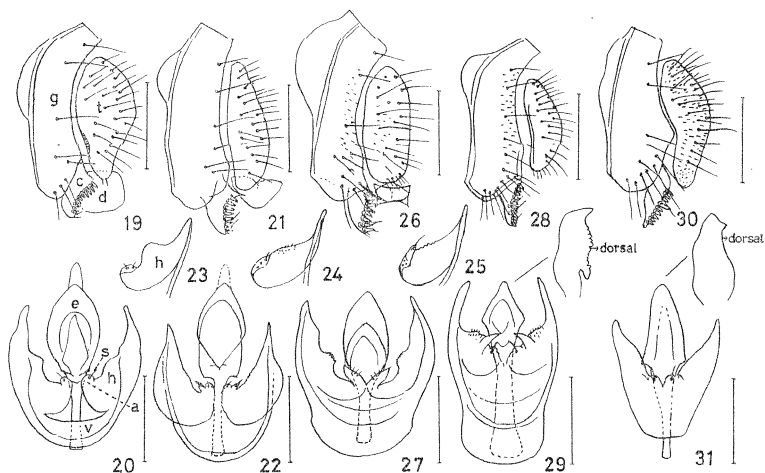
Liodrosophila aerea Okada, 1956. Syst. Study Dros. Jap.: 57 (Japan).

Liodrosophila rugulosa: Okada, 1965. Kontyû, 33: 336.—1968. Kontyû, 36: 330 (not de Meijere, 1914, misidentified).

Specimens examined. TAIWAN, Alishan, 1 ♂, 10-15. VIII. 1967; Chitou, 3 ♂, 1 ♀, 16-17. VIII. 1967 (Okada). HONG KONG, Victoria Peak, 1 ♂, 2 ♀, 19. IX. 1971 (Kurokawa, Okada). SINGAPORE, Forest Reserve, 2 ♂, 23. VII. 1971 (Ikeda). JAVA, Tugu, 1 ♂, 1 ♀, 27-30. VII. 1971; Tjibodas, 1 ♂, 28. VII. 1971 (Ikeda, Okada).

Distribution. Japan, Korea, Ryukyus, Taiwan (n. loc.), Hong Kong (n. loc.), Singapore (n. loc.), Java (n. loc.).

Remarks. Differences in the structure of hypandrium between this species (Fig. 22) and the related species, *L. bicolor* Okada (Fig. 23), *L. castanea* Okada and Chung (Fig. 24), and *L. fuscipennis* Okada (Fig. 25) are as illustrated. Submedian spine of this species was erroneously figured as very long by me, 1965, loc. cit. : 335, fig. 25.



Figs. 19-31. Peripheral (upper) and phallic (lower) organs. 19, 20. *Liodrosophila rugulosa* (de Meijere) from Java; 21, 22. *L. aerea* Okada from Ryukyus; 23. *L. bicolor* Okada from Ryukyus; 24. *L. castanea* Okada and Chung from Korea; 25. *L. fuscipennis* Okada from Nepal; 26, 27. *L. nitida* Duda from Sumatra; 28, 29. *L. spinata* n. sp. from Taiwan; 30, 31. *L. rufa* n. sp. from Hong Kong. Signs and scales as in Figs. 1-10.

***Liodrosophila nitida* Duda** Figs. 26, 27

Liodrosophila nitida Duda, 1922. Arch. Naturg. 88A4: 157 (Vietnam, Taiwan).—1923. Annls. hist.-nat. Mus. natn. hung. 20: 38 (Taiwan).—1924. Arch. Naturg. 90A3: 241 (Taiwan).—Okada, 1968. Bull. Br. Mus. nat. Hist. Suppl. 6: 54 (Nepal).—Takada, Momma & Shima, 1973. J. Fac. Sci. Hokkaido Univ. VI, 19: 77 (Sabah).

Diagnosis. Body brownish black. Eye sparsely piled. Parafrontalia narrow. Front and mesoscutum smooth. Acrostichal hairs in 6 rows. Legs yellow, femora mostly black. Haltere black or dark brown (yellow in the original description). 3C fringe 1/2-2/3.

Periphallic organs (Fig. 26): Generally brownish black. Epandrium and cercus with microtrichia. Surstylus with about 10 teeth in a convex row; subapical tooth stout and long. Phallic organs (Fig. 27): Generally brownish black. Aedeagus fusiform, $PI=1.5$. Hypandrium finely serrated, with fine submedian spine on conical process. Ventral fragma quadrate.

Specimens examined. JAPAN, Kirishima, 1 ♀, 19-21. VIII. 1965 (Okada). RYUKYUS, Komi, Iriomote Is., 1 ♀, 5. X. 1973 (Kitagawa). TAIWAN, Wulai, 1 ♂, 3 ♀, 10. VIII. 1967; Chitu, 1 ♀, 9. VIII. 1967; Alishan 1 ♂, 14. VIII. 1967; Chitou, 6 ♂, 6 ♀, 16-17. VIII. 1967; Puli, 1 ♀, 19. VIII. 1967; Chai-I, 1 ♀, 11. VIII. 1967; Yunshui, 1 ♂, 2 ♀, 12-18. VIII. 1967 (Okada); Kenting, 4 ♂, VII. 1968 (Momm). HONG KONG, Victoria Peak, 1 ♀, 19. IX. 1971 (Okada); Sunada, 1 ♀, 28. V. 1971 (Kitagawa). THAILAND, Kaeng Khoi, 2 ♂, 2 ♀, 19. VIII. 1971; Bang Kok, 1 ♂, 9. VIII. 1971 (Okada). MALAYA, Penang, 1 ♂, 20. VII. 1971 (Okada); Kuala Lumpur 3 ♀, 20-22. VII. 1971 (Ikeda). SINGAPORE, Mc Richie Forest, 1 ♂, 16. VII. 1971; Forest Reserve, 11 ♂, 18 ♀, 23. VII. 1971 (Ikeda, Okada). JAVA, Tugu, 1 ♀, 27. VII. 1971 (Okada). SUMATRA, Pekanbaru, 1 ♂, 1 ♀, 1-4. VIII. 1971 (Kurokawa, Okada).

Distribution. Japan (n. loc.), Ryukyus (n. loc.), Hong Kong (n. loc.), Taiwan, Vietnam, Nepal, Thailand (n. loc.), Malaya (n. loc.), Singapore (n. loc.), Java (n. loc.), Sumatra (n. loc.), Sabah.

***Liodrosophila spinata* n. sp. Figs. 28, 29**

Diagnosis. Body brown. Eye bare. Parafrontalia rather broad. Frontal shield smooth. Mesoscutum nearly entirely smooth. Legs largely yellow. Acrostichal hairs in 6 rows. Hypandrium with an acute process, thus the specific name.

♂, ♀. Body about 1.5 mm in length. Head slightly broader than thorax. Eye dark red, bare. Antenna with 2nd joint dark brown, 3rd black. Arista with 4-5 upper and 2 lower branches besides a moderate fork. Palpus black. Clypeus black. Parafrontalia broad, glossy brownish black. Front glossy brownish black, nearly as broad as long. Face glossy dark brown; carina paler, short but high. Cheek narrow, yellowish brown. Proclinate orbital 2/3 as long as posterior reclinate.

Mesoscutum glossy castaneous brown, caudally darker, without microtrichia. Scutellum mat brownish black. Humeral 2. Acrostichal hairs in 6 rows. Anterior scutellars half as long as posteriors. Legs yellowish grey, femora black. Wing hyaline, R_{2+3} gently curved to costa, R_{4+5} and M slightly convergent. C-index 1.0, 4V-index 2.0, 4C-index 2.0, 5x-index 1.3, Ac-index 4.5, 3C fringe 1/2. Haltere black or yellowish grey. Abdominal tergites glossy deep black.

Periphallic organs (Fig. 28): Epandrium black, with microtrichia. Cercus yellow, without microtrichia. Surstylus black, with about 10 teeth in slightly concaved row. Phallic organs (Fig. 29): Generally black. Aedeagus fusiform. $PI=0.6$. Hypandrium pubescent, with a pointed process, and with submedian spine short and inserted on a small conical process. Ventral fragma quadrate.

Ovipositor yellowish brown, with about 18 marginal and 4 long upper teeth.

Specimens examined. TAIWAN, Chitou, 3 ♂ (incl. Holotype), 2 ♀; Yun-shui, 1 ♀; Puli, 1 ♂; Wulai, 1 ♀, 9-19. VIII. 1967 (Okada, Throckmorton).

Distribution. Taiwan.

Relationships. Resembling *L. nitida* Duda in having smooth glossy front and mesoscutum, but distinguished in having paler mesoscutum, broader parafrontalia, and pointed process of hypandrium.

***Liodrosophila rufa* n. sp.** Figs. 30, 31

Diagnosis. Body reddish brown, thus the specific name. Eye with piles. Parafrontalia very broad. Front and mesoscutum glossy orange brown. Acrostichal hairs in 6 rows. Legs yellowish brown.

♂, ♀. Body about 2 mm in length, brownish red. Head broader than thorax. Eye red, with piles. Antenna reddish brown, carina with about 5 upper and 2 lower branches besides a moderate fork. Palpus brown, Periorbit very broad, black. Frontal shield quadrate, glossy dark brown, somewhat shrunk, anteriorly orange. Ocellar triangle black. Carina high but short. Cheek narrow. Proclinate orbital $2/3$ as long as posterior reclinate. Second oral slightly shorter than vibrissa.

Mesoscutum glossy orange brown, caudally black, nearly entirely smooth. Scutellum velvety black. Thoracic pleura darker than mesoscutum. Acrostichal hairs in 6 rows. Legs yellowish brown. Wing hyaline, R_{2+3} straight. C-index 1.7-2.0, 4V-index 2.0, 4C-index 1.5, 5x-index 1.5, Ac-index 3.0, 3C fringe $2/5$. Haltere yellow. Abdominal tergites black.

Periphallic organs (Fig. 30): Epandrium dark brown, without microtrichia. Cercus paler, lower tip dark, with microtrichia. Surstylus with about 9 teeth in a straight row, a median tooth twice as long as others. Phallic organs (Fig. 31): Generally dark brownish black. Aedeagus fusiform, apically with a short claw dorsally. PI=1.0. Hypandrium bare, with moderate submedian spine. Ovipositor pale brown, ventrally darker, with about 12 lower marginal and 3 upper long teeth.

Specimens examined. HONG KONG, Victoria Peak, 1 ♂ (Holotype), 2 ♀, 19. IX. 1971 (Okada).

Distribution. Hong Kong.

Relationships. Somewhat resembling the foregoing species, *L. spinata*, in having glossy brown caudally black mesoscutum, broad periorbit, and anteriorly orange front, but distinguished in higher C-index, shorter 3C fringe and piled eye.

***Liodrosophila fuscata* n. sp.** Figs. 32, 33

Diagnosis. Body greyish brown, thus the specific name. Eye with sparse piles. Parafrontalia broad. Front smooth. Mesoscutum subshining, pubescent. Acrostichal hairs in 6 rows. Legs yellowish grey, femora fuscous.

♂. Body about 1.5 mm in length. Head as broad as thorax. Eye sparsely pubescent. Antenna dark reddish brown, arista with 4 upper and 2 lower branches besides a large fork. Palpus black. Parafrontalia broad, dark brown. Front glossy dark brown, smooth, anteriorly paler. Face glossy dark brown, carina high but short. Cheek $1/5$ as broad as eye diameter. Clypeus black. Proclinate orbital slightly shorter than posterior reclinate. Second oral fine.

Mesoscutum subshining dark brown, pubescent. Scutellum dark brown, pollinose in grey. Thoracic pleura darker below. Humerals 2, subequal. Acrostichal hairs in 6 rows. Scutellars equally apart from each other. Legs yellowish grey, fore femur slightly darker. Wing slightly fuscous, R_{2+3} strongly curved to costa, R_{4+5} and M slightly convergent. C-index 1.2, 4V-index 2.0, 4C-index 1.8, 5x-index 2.0, Ac-index 5.8, 3C fringe $1/2$. Haltere yellowish white. Abdominal tergites glossy black.

Periphallic organs (Fig. 32): Generally black. Epandrium with microtrichia, cercus without microtrichia. Surstylus with about 10 black teeth in a straight row. Phallic organs (Fig. 33): Generally black. Aedeagus fusiform. Hypandrium pubescent and with a moderate thick submedian spine inserted on a conical process. Ventral fragma triangular.

Specimens examined. TAIWAN, Chitou, 1 ♂ (Holotype), 16. VIII. 1967; Yunshui, 1 ♂, 12. VIII. 1967 (Okada).

Distribution. Taiwan.

Relationships. Resembling *L. fuscipennis* Okada (Fig. 25) from Nepal especially in male genitalia, but distinguished by paler body and pubescent hypandrium.

***Liodrosophila ciliatipes* n. sp. Figs. 34, 35**

Diagnosis. Body glossy black. Eye bare. Parafrontalia broad. Front smooth. Mesoscutum granulose. Acrostichal hairs in 6 rows. Legs yellow, femora darker. Male fore tarsi with long hairs along dorsal and ventral surfaces, thus the specific name.

♂, ♀. Body about 2.2 mm in length. Head slightly broader than thorax. Eye dark brown, bare. Antenna orange brown, arista with 4-5 upper and 2 lower branches besides a large fork. Palpus brown, with apical seta stout. Clypeus black. Parafrontalia broad. Periorbit glossy black, anteriorly narrowing. Front glossy black, as broad as long. Face black, paler at buccal margin. Carina high, grey. Cheek dark yellow, $1/6$ as broad as eye diameter. Proclinate orbital slightly shorter than posterior reclinate. Second oral slightly shorter than vibrissa.

Mesoscutum mat black, much granulose. Scutellum mat velvety black. Thoracic pleura mat black, with thick microtrichia. Humerals 2, subequal. Acrostichal hairs in 6 rows. Anterior scutellars half as long as posteriors. Legs yellow, femora darker subapically. Fore tarsi with dense hairs along dorsal and ventral surfaces. Wing hyaline, R_{2+3} nearly straight, R_{4+5} and M parallel. C-index 2.0, 4V-index 2.0, 4C-index 1.5, 5x-index 2.0, Ac-index 3.3,

3C fringe 5/9. Haltere yellow. Abdominal tergites somewhat granulose glossy black.

Periphallic organs (Fig. 34): Epandrium black, paler below, without microtrichia. Cercus yellow, without microtrichia. Surstylus with about 10 teeth in a medially broadly interrupted concaved row. Phallic organs (Fig. 35): Generally dark brown. Aedeagus elongate fusiform, $PI=1.0$. Hypandrium bare, with moderate submedian spine inserted on conical process. Ventral fragma quadrate. Ovipositor orange brown, with about 18 marginal and 4 long upper teeth.

Specimens examined. TAIWAN. Alishan, 16 ♂ (incl. Holotype), 20 ♀, 14-15. VIII. 1967 (Okada, Throckmorton).

Distribution. Taiwan.

Relationships. Resembling *L. globosa* Okada (Fig. 54) in having broadly interrupted concaved row of teeth on surstylus, but distinguished by darker body, granulose mesoscutum, and 6 rows of acrostichal hairs (2 in *globosa*).

***Liodrosophila bifurcata* n. sp.** Figs. 36, 37

Diagnosis. Body black. Eye sparsely piled. Periorbit broad. Front smooth. Mesoscutum very finely granulose. Acrostichal hairs in 6 rows. Hind femur basally white, distally black. Aedeagus apically bifurcated, thus the specific name.

♂. ♀. Body about 2 mm in length. Head slightly broader than thorax. Eye dark red, sparsely piled. Antenna with 2nd joint dark brown, 3rd black. Periorbit broad, glossy black. Frontal shield glossy black, somewhat shining blue, as long as broad. Clypeus black. Face glossy black, carina short. Cheek glossy black, narrow, $1/8$ as broad as eye diameter. Proclinate orbital half as long as posterior reclinate. Second oral as long as vibrissa.

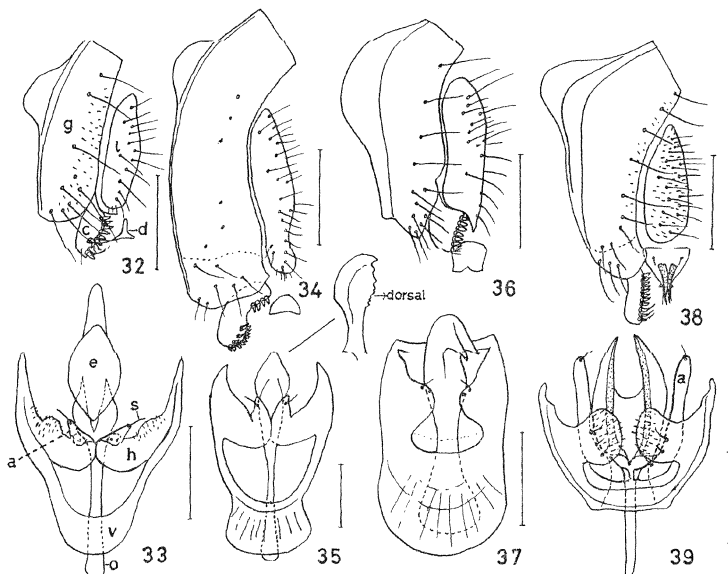
Mesoscutum bluish black, very finely granulose. Scutellum velvety black. Thoracic pleura glossy black. Humerals 2, upper longer. Acrostichal hairs in 6 rows. Anterior scutellars $4/7$ as long as posteriors, which are equally apart from anteriors and from each other. Wing hyaline, R_{2+3} straight. C-index 1.5, 4V-index 1.8, 4C-index 1.4, 5x-index 2.0, Ac-index 4.0, 3C fringe $1/2$. Haltere yellow. Abdominal tergites black.

Periphallic organs (Fig. 36): Epandrium dark brown, without microtrichia. Cercus white, pointed below, without microtrichia. Surstylus with about 9 teeth in a straight row. Phallic organs (Fig. 37): Generally black. Aedeagus apically with two recurved claws. $PI=1.0$. Hypandrium bare, with moderate submedian spine. Ventral fragma rounded. Ovipositor pale yellowish grey, with about 15 marginal and 6 upper teeth.

Specimens examined. JAVA, Tjibodas, 2 ♂ (incl. Holotype), 2 ♀, 28. VII. 1971; Bogor, 1 ♂, 27. VII. 1971; Tugu, 2 ♀, 27-30. VII. 1971 (Ikeda, Kurokawa, Okada).

Distribution. Java.

Relationships. Resembling *L. nitida* Duda in having smooth mesoscutum and front, basally white apically black hind femur, and sparsely piled eye, but distinguished by broad periorbit, long second oral, and clawed aedeagus.



Figs. 32-39. Peripheral (upper) and phallic (lower) organs. 32, 33. *Liodrosophila fuscata* n. sp. from Taiwan; 34, 35. *L. ciliatipes* n. sp. from Taiwan; 36, 37. *L. bifurcata* n. sp. from Java; 38, 39. *L. marginifrons* Duda from Java. Signs and scales as in Figs. 1-10.

***Liodrosophila marginifrons* Duda** Figs. 38, 39

Liodrosophila marginifrons Duda, 1922. Arch. Naturg. 88A4: 157 (Vietnam). — 1926. Supplta. Ent. 14: 53 (Sumatra).

Liodrosophila nitida var. *marginifrons*: Duda, 1926. Supplta. Ent. 14: 53 (Sumatra).

Not *Liodrosophila nitida* var. *marginifrons*: Okada, 1964. Nature and Life South-east Asia, 3: 440 (misidentified).

Diagnosis. Body dark brownish black. Eye with piles. Periorbit broad, reaching anterior margin of front. Front pubescent. Acrostichal hairs in 2 rows. Hind femur basally white, distally black. Aedeagus apparently bifurcated. Paramere unusually large.

♂, ♀. Body about 1.0-1.5 mm in length. Eye dark red, with fine piles. Antenna brown, arista with about 5 upper and 3 lower branches besides a fine fork. Periorbit glossy brownish black, broad, reaching anterior margin of front. Front brownish black, with longitudinal shrinks, anteriorly orange. Cheek narrow.

Mesoscutum dark brownish black, finely pubescent. Scutellum velvety black. Humerals 2. Acrostichal hairs in 2 rows. Anterior scutellars 2/7 as long as posteriors, which are nearer proclinate than each other. Legs yellowish brown, femora black, hind femur basally white. C-index 1.3, 4V-index 3.0, 4C-index 2.2, 5x-index 2.4, Ac-index 4.0, 3C fringe 1/2. Haltere yellow. Abdominal tergites glossy black.

Periphallalic organs (Fig. 38): Epandrium black, lower tip pale, with sparse microtrichia. Cercus pale grey, with microtrichia. Surstylus with about 12 teeth in a straight row. Phallic organs (Fig. 39): Aedeagus pale brown, elongate, apparently bifid. PI=1.2. Hypandrium roundly convexed, with thick microtrichia. Paramere (?) unusually large, apically with a fine spine, basally with a few sensilla. Ovipositor yellowish brown, with about 15 marginal and 5 upper short teeth.

Specimens examined. MALAYA, Penang, 1 ♂, 15. VII. 1971 (Okada). JAVA, Tugu, 15 ♂, 31 ♀, 27-30. VII. 1971; Tjibodas, 1 ♂, 28. VII. 1971; Bogor 3 ♂, 27. VII. 1971 (Ikeda, Kurokawa, Okada). SARAWAK, Kuching, 1 ♂, 1. VI. 1971 (Kitagawa).

Distribution. Vietnam, Java (n. loc.), Sumatra, Malaya (n. loc.), Sarawak (n. loc.).

***Liodrosophila submarginalis* n. sp.**

Liodrosophila nitida var. *marginifrons*: Okada, 1964. Nature and Life Southeast Asia, 3: 440 (not *marginifrons* Duda; misidentified).

Diagnosis. Body brown. Eye nearly bare. Periorbit rather broad, not reaching anterior margin of front. Parafrontalia broad, anteriorly orange. Front smooth. Mesoscutum pubescent. Acrostichal hairs in 2 rows. Aedeagus rod-shaped. Close to *L. marginifrons* Duda, thus the specific name.

♂, ♀. Body about 1.5-2.0 mm in length, generally brown. Eye nearly bare. Periorbit rather broad, but not reaching anterior margin of front. Parafrontalia broad, anteriorly orange. Front glossy dark reddish brown, as broad as long. Clypeus dark brown. Face orange brown, carina short. Cheek 1/5 eye diameter. Proclinate orbital 2/3 as long as posterior reclinate. Second oral slightly shorter than vibrissa.

Mesoscutum pubescent, dark castaneous brown, caudally fuscous. Scutellum velvety brown. Thoracic pleura dark brown, paler above. Humerals 2, subequal. Acrostichal hairs in 2 rows. Legs yellow, coxae and trochanters of fore and mid legs black, distal half of hind femur black. Wing (fig. Okada, 1964. loc. cit.: 441) hyaline, R_{2+3} nearly straight, R_{4+5} and M slightly convergent. C-index 1.6, 4V-index 2.5, 4C-index 1.7, 5x-index 1.7, Ac-index 4.7, 3C fringe 2/3.

Haltere yellow. Abdominal tergites brownish black.

Periphallic organs (fig. Okada, 1964, loc. cit. 441) brown. Epandrium and cercus without microtrichia. Surstylus with about 12 teeth in a straight row. Phallic organs (fig. Okada, 1964, loc. cit.: 441): Aedeagus elongate fusiform, $PI=1.0$. Hypandrium bare, with short submedian spine. Ventral fragma triangular. Ovipositor (fig. Okada, 1964, loc. cit.: 441) orange brown, with about 13 marginal and 3 upper short teeth.

Specimens examined. BRUNEI, Amo, 1 ♂ (Holotype), 5 ♀, 22. II. 1962 (Imadate).

Distribution. Brunei.

Relationships. Allied to the foregoing species, *L. marginifrons* Duda, similar in dark brown pubescent mesoscutum, broad periorbit, basally pale hind femur, and yellow haltere, but distinguished by smooth front, shorter periorbit, nearly bare eye, and higher C-index.

***Liodrosophila dictenia* n. sp. Figs. 42, 43**

Diagnosis. Body dark brownish black. Eye with piles. Periorbit broad, not reaching anterior margin of front. Mesoscutum pubescent. Acrostichal hairs in 2 rows. Surstylus with 2 rows of teeth, thus the specific name.

♂, ♀. Body about 1.5-2.0 mm in length. Eye with piles. Arista with 5 upper and 2 lower branches besides a moderate fork. Palpus and clypeus black. Periorbit glossy brownish black, rather broad, but not reaches anterior margin of front. Parafrontalia broad. Face brownish black, darker below. Carina high and narrow. Cheek glossy black, narrow. Procline orbital half as long as posterior reclinate. Second oral slightly shorter than vibrissa.

Mesoscutum dark brownish black, pubescent. Scutellum velvety black. Thoracic pleura darker than mesoscutum. Acrostichal hairs in 2 rows. Anterior scutellars half as long as posteriors, which are slightly nearer each other than anteriors. Legs yellow, fore and mid coxae black, hind coxa white, fore femur black, hind femur distally black. Wing hyaline, R_{2+3} curved to costa, R_{4+5} and M parallel. C-index 1.5, 4V-index 2.0, 4C-index 1.7, 5x-index 1.5-2.0, Ac-index 3.5-4.0, 3C fringe 1/2. Haltere yellow. Abdominal tergites glossy black.

Periphallic organs (Fig. 42): Epandrium black, paler below, with sparse microtrichia. Cercus paler, with microtrichia, lower tip dilated and with a stout black spine. Surstylus black, with 2 straight rows of about 6 teeth each. Phallic organs (Fig. 43): Generally dark brown. Aedeagus slender, bare. $PI=1.2$. Hypandrium bare, with very long submedian spine. Ovipositor yellow, with about 17 marginal and 4 upper teeth.

Specimens examined. JAVA, Tugu, 1 ♂ (Holotype), 4 ♀, 27-30. VII. 1971; Bogor, 1 ♀, 27. VII. 1971 (Okada). MALAYA, Penang, 2 ♂, 2 ♀, 17-19. VII. 1971; Kuala Lumpur, 2 ♂, 3 ♀, 20-22. VII. 1971 (Ikeda, Kurokawa, Okada), 1 ♂, 12. VI. 1971 (Kitagawa). BRUNEI, Brunei Town, 24 ♂, 16 ♀, 3. VII. 1971 (Kitagawa).

wa). SARAWAK, Kuching, 1 ♂, 7. VII. 1971 (Kitagawa).

Distribution. Java, Malaya, Brunei, Sarawak.

Relationships. Similar with *L. pusilla* (de Meijere) in having narrow periorbit, pubescent mesoscutum, and anteriorly orange front, but distinguishable by darker hind femur and higher C-index.

***Liodrosophila ceylonica* n. sp.** Figs. 40, 41

Diagnosis. Body black. Eye with piles. Periorbit narrow. Front finely punctured. Second oral as long as vibrissa. Acrostichal hairs in 2 rows. Legs pale. Aedeagus hairy.

♂, ♀. Body black, 1.2 mm in length. Eye with piles. Antenna dark brown 3rd joint basally paler. Arista with 5 upper and 2 lower branches besides a moderate fork. Palpus dark brown. Periorbit narrow, glossy, brownish black. Frontal shield glossy brownish black, finely and sparsely punctured. Face brown, carina low. Cheek very narrow. Second oral nearly as long as vibrissa.

Mesoscutum subshining black, thickly pubescent. Scutellum velvety black. Acrostichal hairs in 2 rows. Anterior scutellars 3/8 as long as posteriors, posteriors equally apart from anteriors and from each other. Legs yellowish grey. Wing hyaline, R_{2+3} straight. C-index 1.2, 4V-index 2.3, 4C-index 2.3, 5x-index 1.7, Ac-index 4.4, 3C fringe 5/8. Haltere yellow. Abdominal tergites glossy black.

Periphallic organs (Fig. 40): Epandrium dark brownish black, with microtrichia. Cercus pale brown, with microtrichia. Surstylus with about 10 short teeth in nearly straight row. Phallic organs (Fig. 41): Generally black, Aedeagus paler, fusiform, hairy. PI=1.0. Hypandrium bare, with moderate submedian spine. Ventral fragma quadrate. Ovipositor orange yellow, with about 13 marginal and 6 upper slightly longer teeth.

Egg about 0.4 mm in length, with 4 subequal filaments, which are nearly half as long as egg itself.

Specimens examined. CEYLON, Kandy, 22 ♂ (incl. Holotype), 15 ♀; Colombo, 8 ♂, 1 ♀; Peradeniya, 8 ♂, 7 ♀, 18-20. VIII. 1971; (Ikeda, Kurokawa, Okada). TAIWAN, Yuanshui, 4 ♂, 5 ♀, 12-18. VIII. 1966 (Throckmorton, Okada).

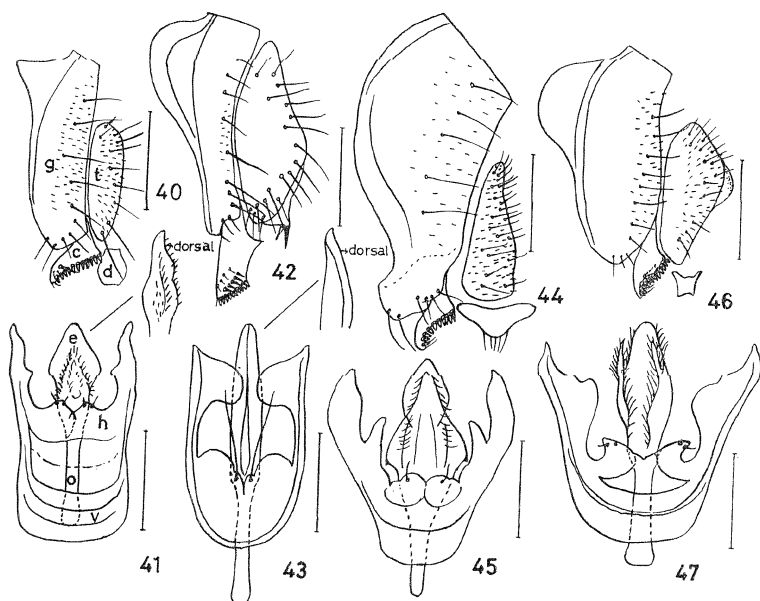
Distribution. Ceylon, Taiwan.

Relationships. Resembling *L. dimidiata* Duda in having narrow periorbit, pubescent mesoscutum, long second oral, and hairy aedeagus, but distinguished by finely punctured front, higher C-index, and non-lobed aedeagus.

***Liodrosophila dimidiata* Duda** Figs. 46, 47

Liodrosophila dimidiata Duda, 1922. Arch. Naturg. 88A4: 158 (Vietnam).—1923. Annls. hist.-nat. Mus. natn. hung. 20: 38 (Taiwan).—1926. Supplta. Ent. 14: 53 (Sumatra).

Diagnosis. Body dark brown. Eye with piles. Periorbit narrow. Front



Figs. 40-47. Peripheral (upper) and phallic (lower) organs. 40, 41. *Lio-drosophila ceylonica* n. sp. from Ceylon; 42, 43. *L. dictenia* n. sp. from Malaya; 44, 45. *L. varians* Duda from Sumatra; 46, 47. *L. dimidiata* Duda from Malaya. Signs and scales as in Figs. 1-10.

anteriorly orange. Mesoscutum dark brown, anteriorly paler, finely pubescent. Acrostichal hairs in 2 rows. Aedeagus hairy.

♂, ♀. Body about 1.0 mm in length, dark brownish black. Eye dark reddish brown, with piles. Periorbit narrow. Palpus black. Front glossy brownish black, shining blue, anteriorly dark orange. Cheek black, narrow. Second oral as long as vibrissa.

Mesoscutum glossy castaneous brown, caudally darker, finely pubescent. Scutellum velvety brownish black. Acrostichal hairs in 2 rows. Anterior scutellars 2/5 as long as posteriors. Legs yellow, basal half of hind femur black. Wing hyaline, R_{2+3} straight. C-index 0.8, 4V-index 2.5-3.0, 4C-index 2.3, 5x-index 2.0, Ac-index 4.0, 3C fringe 5/7. Haltere yellow. Abdominal tergites glossy black.

Peripheral organs (Fig. 46): Epandrium and cercus black, with microtrichia. Surstylus with about 10 short teeth in a nearly straight row. Phallic organs (Fig. 47): Generally brownish black. Aedeagus hairy, oblong, with lateral hairy branches. PI=1.2. Hypandrium bare, with a moderate submedian spine

on pointed conical process. Ventral fragma quadrate. Ovipositor pale yellow, with about 14 marginal and 5 upper short teeth.

Specimens examined. HONG KONG, Victoria Peak, 1 ♂, 2 ex. 19.IX.1971 (Okada). MALAYA, Kuala Lumpur, 2 ♂, 4 ♀, 20-22. VIII. 1971 (Ikeda, Okada). SINGAPORE, Forest Reserve, 2 ♂, 2 ♀, 25. VII. 1971 (Ikeda, Kurokawa); Mc Richie Forest, 1 ♀, 16. VII. 1971 (Okada). SARAWAK, Kuching, 2 ♂, 1 ♀, 7. VI. 1971 (Kitagawa).

Distribution. Taiwan, Hong Kong, (n. loc.) Vietnam, Malaya (n. loc.), Singapore (n. loc.), Sumatra, Sarawak (n. loc.).

***Liodrosophila pusilla* (de Meijere) Figs. 48, 49**

Camilla pusilla de Meijere, 1911. Tijdschr. Ent. 54: 423 (Java).—1918. Tijdschr. Ent. 60: 345 (Java).

Liodrosophila pusilla: Duda, 1922. Arch. Naturg. 88A4: 156 (Java).

Diagnosis. Body brownish black. Eye nearly bare. Periorbit and parafrontalia narrow anteriorly. Front entirely smooth. Mesoscutum densely pubescent. Acrostichal hairs in 2 rows. Legs with hind femur yellow.

♂, ♀. Body about 1.5 mm in length. Head broader than thorax. Eye dark red, nearly bare. Antenna with 2nd joint dark brown, 3rd mat black. Arista with 5 upper and 2 lower branches besides a moderate fork. Palpus black. Periorbit and parafrontalia much narrowing anteriorly. Frontal shield glossy brownish black, somewhat shining blue, entirely smooth, anteriorly dark orange. Face brownish black, carina brown, half as long as face. Cheek glossy black, narrow. Proclinate orbital 2/3 as long as posterior reclinate. Second oral 2/3 as long as vibrissa.

Mesoscutum dark brownish black, shining blue, densely and finely pubescent. Scutellum velvety black. Acrostichal hairs in 2 rows. Anterior scutellars half as long as posteriors, which are nearer anteriors than each other. Legs yellow, fore and mid femora brownish black except apically, hind femur yellow. Wing hyaline, R_{2+3} nearly straight. C-index 1.1, 4V-index 2.2, 4C-index 2.0, 5x-index 2.0, Ac-index 4.0, 3C fringe 4/7. Haltere yellow. Abdominal tergites glossy black.

Periphallic organs (Fig. 48): Epandrium brownish black, paler and narrowing below, with microtrichia. Cercus pale brown, with microtrichia. Stylus with about 8 teeth in a concaved row. Phallic organs (Fig. 49): Generally pale brown. Aedeagus slender, without microtrichia. PI = 1.0. Hypandrium bare, with very long submedian spine. Ventral fragma quadrate. Ovipositor orange brown, with about 15 marginal and 5 upper short teeth.

Egg about 0.45 mm in length, with 4 subequal filaments, which are 2/3 as long as egg itself.

Specimens examined. MALAYA, Kuala Lumpur, 6 ♂, 9 ♀, 20-22. VII. 1971; Penang, 6 ♂, 7 ♀, 20. VII. 1971 (Ikeda, Kurokawa, Okada). SINGAPORE, Forest Reserve, 166 ♂, 118 ♀, 23. VII. 1971; Botanical Garden, 2 ♂, 16. VII. 1971; Mc

Richie Forest, 2♂, 16. VII. 1971; Swamp Forest, 1♀, 24. VII. 1971 (Ikeda, Kurokawa, Okada).

Distribution. Java, Malaya (n. loc.), Singapore (n. loc.).

Remarks. No specimens from the original locality, Java, are at hand. The specimens examined show slight difference from the original form in obscurely demarcated and darker 'orange area' at the anterior end of front.

***Liodrosophila globosa* Okada** Figs. 54, 55

Liodrosophila globosa Okada, 1965. Kontyû, 33: 334 (Ryukyus).

Diagnosis: Body dark brownish black. Eye nearly bare. Periorbit broad, not reaching anterior margin of front. Front smooth. Mesoscutum densely punctured. Acrostichal hairs in 2 rows. Anterior scutellars half or more as long as posteriors.

Periphallic organs (Fig. 54) dark brown. Epandrium and cercus without microtrichia. Surstylus globular, thus the specific name, with a medially broadly interrupted concaved row of about 10 teeth. Phallic organs (Fig. 55): Aedeagus elongate fusiform, finely pubescent. PI = 1.0. Hypandrium bare, with long submedian spine. Ventral fragma quadrate. Ovipositor pale yellow, with about 12 marginal and 4 upper short teeth.

Specimens examined. RYUKYUS, Komi, Iriomote Is., 1♂, 1♀, 9. VII. 1966 (Okada); River Nakama, 1♂, 6. X. 1973 (Kitagawa). TAIWAN, Kenting, 2♂, 3♀, VII. 1968 (Momma); Kuang-tzulin, 1♀, 24. V. 1971 (Kanmiya); Yunshui, 1♂, 12-18. VIII. 1967 (Throckmorton). JAVA, Tugu, 3♂, 1♀, 27-30. VII. 1971 (Okada). SUMATRA, Pekanbaru, 1♂, 2-4. VIII. 1971 (Okada). SABAH, Tataluan, 1♂, 1♀, 21. VIII. 1968 (Imadate). CEYLON, Kandy, 17♂, 8♀, 18-20. VIII. 1971; Peradeniya, 12♂, 11♀, 17-19. VIII. 1971; Colombo, 1♂, 16-19. VIII. 1971 (Ikeda, Kurokawa, Okada).

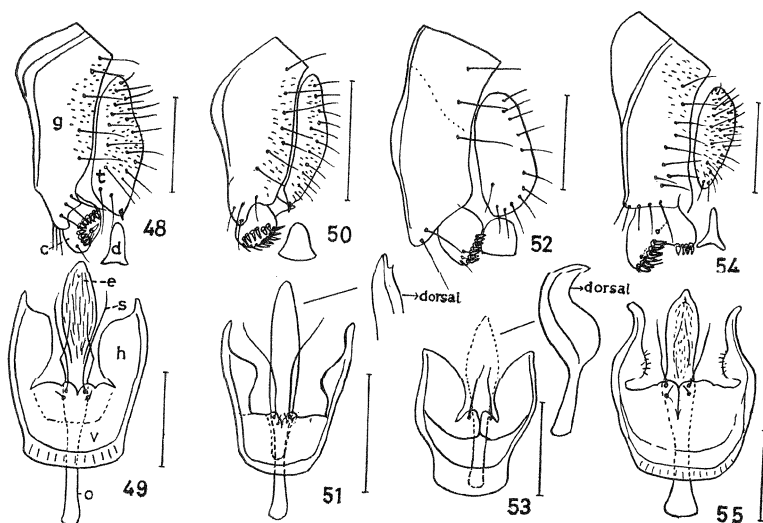
Distribution. Ryukyus, Taiwan (n. loc.), Java (n. loc.), Sumatra (n. loc.), Sabah (n. loc.), Brunei (n. loc.), Ceylon (n. loc.).

***Liodrosophila varians* Duda** Figs. 44, 45

Liodrosophila varians Duda, 1922. Arch. Naturg. 88A4: 158 (Vietnam).

Diagnosis. Body deep black. Eye with piles. Periorbit narrowing anteriorly. Parafrontalia broad. Front glossy brown, smooth. Mesoscutum deep black, finely granulose. Scutellum roughly granulose. Acrostichal hairs in 4 rows. Legs with hind femur pale.

♂, ♀. Body 1.5-2.5 mm in length. Head slightly broader than thorax. Eye dark red, with piles. Antenna yellowish brown, arista with 3 upper and 2 lower branches besides a large fork. Periorbit black, anteriorly narrowing, parafrontalia broad and anteriorly orange brown. Front glossy brownish black, anteriorly orange. Face yellowish brown, carina high and half as long as face. Cheek grey, 1/6 as broad as eye diameter. Clypeus dark brown. Proclinate



Figs. 48-55. Peripheral (upper) and phallic (lower) organs. 48, 49. *Liodrosophila pusilla* (de Meijere) from Singapore; 50, 51, *L. sp. 3* from Celebes; 52, 53. *L. fasciata* Duda from Java; 54, 55. *L. globosa* Okada from Ceylon. Signs and scales as in Figs. 1-10.

orbital 2/3 as long as posterior reclinate. Second oral long but thin.

Mesoscutum subshining deep black, finely granulate. Scutellum roughly granulate, black. Humeral 2. Acrostichal hairs in 4 rows. Anterior scutellars 2/3 as long as posteriors, which are nearer anteriors than each other. Legs yellow including hind femur. Wing with R_{2+3} nearly straight, R_{4+5} and M parallel. C-index 1.3, 4V-index 2.2, 4C-index 1.8, 5x-index 2.0, Ac-index 3.5, 3C fringe 2/5. Haltere yellow. Abdominal tergites glossy deep black.

Peripheral organs (Fig. 44): Epandrium black, paler and constricted below, with microtrichia. Cercus yellowish brown, with microtrichia. Surstylus black, with about 11 teeth in a concave row. Phallic organs (Fig. 45): Aedeagus dark brown, hairy, basally much broadened. PI = 1.0. Hypandrium bare, with short submedian spine. Ventral fragma quadrate. Ovipositor yellow, with about 17 marginal and 6 upper longer teeth.

Egg about 0.45 mm in length, with 4 subequal filaments which are slightly shorter than egg.

Specimens examined. HONG KONG, Victoria Peak, 5♂, 4♀, 19.IX.1971 (Okada). MALAYA, Penang, 1♂, 20.VII.1971 (Okada); Ululunga, 16♂, 9♀, 4.VIII.1973 (Yata). SINGAPORE, Forest Reserve, 1♂, 23.VII.1971 (Kurokawa). JAVA, Tugu, 27♂, 19♀, 27-30.VII.1971; Tjibodas, 1♀, 28.VII.1971;

Bogor, 2♂, 3♀, 27. VII. 1971 (Ikeda, Okada). SUMATRA, Pekanbaru, 1♂, 3-4. VIII. 1971 (Ikeda). BRUNEI, Brunei Town, 1♂, 3. VI. 1971 (Kitagawa). LOMBOK, Suranadi, 7♂, 5♀, 21. XII. 1973 (Shinonaga). CEYLON, Kandy, 12♂, 17♀, 17-20. VIII. 1971 (Ikeda, Kurokawa, Okada).

Distribution. Hong Kong (n. loc.), Vietnam, Java (n. loc.), Sumatra (n. loc.), Malaya (n. loc.), Singapore (n. loc.), Brunei (n. loc.), Lombok (n. loc.), Ceylon (n. loc.).

***Liodrosophila fasciata* Duda** Figs. 52, 53

Liodrosophila fasciata Duda, 1926. Supplta. Ent. 14: 54 (Sumatra).

Diagnosis. Eye pubescent. Periorbit narrow. Front and mesoscutum glossy blue black. Acrostichal hairs in 4 rows. Abdominal tergites yellow with medially interrupted caudal black bands.

♂, ♀. Body about 1.5 mm in length. Head much broader than thorax. Eye dark red, with rough piles. Antenna yellowish grey, arista with about 3 upper and 2 lower branches besides a large fork. Palpus yellowish grey. Periorbit very narrow. Parafrontalia also narrow. Clypeus brown. Front glossy blue black, smooth, broader than long. Face reddish brown, carina short and narrow.

Mesoscutum glossy blue black with very fine punctures. Scutellum velvety purple black. Thoracic pleura yellowish white, black above. Acrostichal hairs in 4 rows. Anterior scutellars as long as posteriors, which are nearer each other than anteriors. Legs yellow, fore and mid femora black. Wing hyaline, R_{2+3} nearly straight. C-index 1.2, 4V-index 2.8, 4C-index 2.2, 5x-index 2.0, Ac-index 4.4, 3C fringe 4/7. Haltere black. Abdominal tergites yellow with medially interrupted caudal black bands.

Periphallic organs (Fig. 52): Generally pale yellowish brown, Epandrium and cercus without microtrichia. Surstylus with about 7 teeth in a straight row. Phallic organs (Fig. 53): Aedeagus S-shaped in lateral aspect, pale yellow, ventrally dark. PI = 1.3. Hypandrium pale yellow, bare, with moderate submedian spine. Ventral fragma quadrate. Ovipositor yellowish white, with about 11 marginal and 3 upper short teeth.

Specimens examined. JAVA, Tugu, 3♂, 3♀, 27-30. VII. 1971; Tjibodas, 1♂, 28. VII. 1971 (Okada). MALAYA, Penang, 1♂, 20. VII. 1971 (Okada).

Distribution. Java (n. loc.), Sumatra, Malaya (n. loc.).

***Liodrosophila* sp. 1** Figs. 17, 18

Diagnosis. Frontal shield trapezoid, subshining. Mesoscutum granulose and pollinose. Acrostichal hairs in 6 rows. Fore femur without a row of setulae. Costa reaching M.

♂, ♀. Body about 1.5 mm in length. Head slightly broader than thorax. Eye deep purplish black, with piles. Antenna brownish black. Periorbit rather

broad. Front dark brownish black, trapezoid, broader than long. Face brownish black, carina very short. Cheek very broad, brownish black. Anterior reclinate orbital minute, proclinate $2/3$ as long as posterior reclinate. Scutellum subshining brownish black. Mesoscutum brownish black, granulate and polillose. Humerals 2, subequal. Acrostichal hairs in 6 rows. Anterior scutellars $3/4$ as long as posteriors. Legs black, knees and tarsi yellowish grey. Fore femur without row of setulae inside. Wings hyaline, R_{2+3} straight, R_{4+5} and M parallel, costa weakly reaching end of M. C-index 1.5, 4V-index 3.0, 4C-index 2.0, 5x-index 2.0, Ac-index 3.5, 3C fringe $5/7$. Haltere black. Abdominal tergites mat brownish black, abdomen spherical, somewhat broader than thorax. Periphallallic organs (Fig. 17): Epandrium black, paler below, with microtrichia. Cercus brown, with microtrichia. Surstylus dark orange brown, with about 10 long pointed black teeth in a convexed row. Phallic organs (Fig. 18): Aedeagus dark brown, fusiform. PI = 1.0. Hypandrium bare, pale, with moderate submedian spine.

Specimen examined. TAIWAN, Wulai, 1♂, 10. VIII. 1967 (Throckmorton).

Remarks. Spherical abdomen resembles that of *Sphaerogastrella* species. Absence of setulae row on fore femur is extraordinary in the genus, alike as in *L. fasciata* Duda, *L. pallidipennis* (Harrison), *L. nana* Wheeler and Takada, and *L. trukana* Wheeler and Takada.

Liodrosophila sp. 2

Diagnosis. Very similar with *L. divergens* in this report. Only slightly different in palpi body, longer frontal shield, longer 2nd oral, and finely pubescent mesoscutum.

Specimens examined. MADAGASCAR, Tananarive, 1♂, 1-2. IX. 1971 (Ikeda): Perinet, 1♀, 10. IX. 1971 (Ikeda).

Remarks. Alike as in the other members of Madagascanian *Liodrosophila* species (*L. sinuata*, *L. divergens*, and *L. madagascarenis*, in this report), costa distinctly reaches the end of M. It becomes weak beyond the end of R_{4+5} in ordinary cases of this genus.

Liodrosophila sp. 3 Figs. 50, 51

Diagnosis. Body glossy brown. Eye bare. Periorbit narrow. Parafrontalia broad. Front smooth. Mesoscutum pubescent. Acrostichal hairs in 2 rows. Hind femur yellow.

♂, ♀. Body about 1.8 mm in length. Head slightly broader than thorax. Eye deep red, bare. Antenna black, arista with 5 upper and 2 lower branches besides a large fork. Palpus black. Front glossy black, anteriorly orange. Cheek narrow. Second oral as long as vibrissa. Mesoscutum dark brownish black, pubescent. Scutellum mat velvety brownish black. Humerals 2, subequal. Acrostichal hairs in 2 rows. Anterior scutellars half as long as posteriors.

Legs yellow, fore femur black, R_{2+3} curved to costa, R_{4+5} and M parallel. C-index 1.3, 4V-index 2.2, 4C-index 1.8, 5x-index 2.0, Ac-index 3.5, 3C fringe 3/5. Haltere yellow. Periphallic organs (Fig. 50): Generally yellow. Epandrium and cercus with microtrichia. Surstylus with about 6 teeth in a straight row. Phallic organs (Fig. 51): Generally pale yellow. Aedeagus slender, bare. $PI = 2.0$. Hypandrium bare, with very long submedian spine. Ventral fragma quadrate. Ovipositor pale brown, with about 12 marginal and 6 upper teeth.

Specimens examined. CELEBES, Mario, 3♂, 1♀, 11-12. XII. 1973 (Kurahashi, Shinonaga).

Remarks. Closely allied to *L. pusilla* (de Meijere), distinguished merely by broader parafrontalia and globular surstylus with a straight row of teeth (concaved in *pusilla*).

Catalog of the remaining species

Liodrosophila melania (Séguy)

Scaptomyza melania Séguy, 1938. Mém. Mus. hist. nat. Paris (NS), 8 : 350.

Liodrosophila melania: Tsacas, 1974. Catalogue of Ethiopian Drosophilidae. Mus. natn Hist. nat. Paris (in press).

Distribution. Kenya.

L. pallidipennis (Harrison)

Lissocephala pallidipennis Harrison, 1954. Trans. R. ent. Soc. Lond. 105 : 113.

Liodrosophila pallidipennis: Wheeler and Kambyssellis, 1968. Univ. Texas Publ. 6815 : 538.

Distribution. Samoa.

L. nana Wheeler and Takada

Liodrosophila nana Wheeler and Takada, 1964. Ins. Micr. 14 (6) : 223.

Distribution. Micronesia, Solomon.

L. trukana Wheeler and Takada

Liodrosophila trukana Wheeler and Takada, 1964. Ins. Micr. 14 (6) : 223.

Distribution. Micronesia.

L. sp. a, Wheeler and Takada

Liodrosophila sp. a, Wheeler and Takada, 1964. Ins. Micr. 14 (6) : 224.

Distribution. Micronesia.

L. sp. b, Wheeler and Takada

Liodrosophila sp. b, Wheeler and Takada, 1964. Ins. Micr. 14 (6) : 225.

Distribution. Micronesia.

L. bimaculata Okada

Liodrosophila bimaculata Okada, 1966. Bull. Br. Mus. nat. Hist. Suppl. 6 : 48.

Distribution. Nepal.

L. bicolor Okada Fig. 23

Liodrosophila bicolor Okada, 1956. Syst. Study Dros. Jap.: 59.

Distribution. Japan, Korea, Ryukyus.

L. castanea Okada and Chung Fig. 24

Liodrosophila castanea Okada and Chung, 1960. Akitu, 9: 26.

Distribution. Korea.

L. longiaristata Takada, Momma, and Shima

Liodrosophila longiaristata Takada, Momma, and Shima, 1973. J. Fac. Sci. Hokkaido Univ. VI, 19: 77.

Distribution. Sabah.

L. fuscipennis Okada Fig. 25

Liodrosophila fuscipennis Okada, 1966. Bull. Br. Mus. nat. Hist. Suppl. 6: 51.

Distribution. Nepal.

L. onchopyga Okada

Liodrosophila onchopyga Okada, 1966. Bull. Br. Mus. nat. Hist. Suppl. 5: 50.

Distribution. Nepal.

L. contracta Duda

Liodrosophila contracta Duda, 1926. Supplta. Ent. 14: 55.

Distribution. Sumatra.

Summary of the geographical distribution (*previous record)

Palearctic Region 4 spp.

JAPAN 3 spp. *L. nitida*, *aerea*,* *bicolor*.*

KOREA 2 spp. *L. aerea*,* *castanea*.*

Oriental Region 25 spp.

RYUKYUS 4 spp. *L. nitida*, *aerea*, *bicolor*,* *globosa*.*

TAIWAN 11 spp. *L. quadrimaculata*, *nitida*,* *spinata*, *aerea*, *ciliatipes*, *fuscata*, *pusilla*, *globosa*, *ceylonica*, *dimidiata*,* sp. 1.

HONG KONG 5 spp. *L. nitida*, *rufa*, *aerea*, *dimidiata*, *varians*.

VIETNAM 6 spp. *S. javana*,* *L. nitida*,* *marginifrons*,* *pusilla*,* *dimidiata*,* *varians*.*

THAILAND 3 spp. *S. javana*, *S. rostralis*, *L. nitida*.

NEPAL 4 spp. *L. bimaculata*,* *nitida*,* *fuscipennis*,* *onchopyga*.*

CEYLON 5 spp. *S. javana*, *L. ornata*, *globosa*, *ceylonica*, *varians*.

MALAYA 9 spp. *S. javana*, *L. coeruleifrons*, *nitida*, *marginifrons*, *pusilla*, *dictenia*, *dimidiata*, *varians*, *fasciata*.

SINGAPORE 6 spp. *S. javana*, *L. nitida*, *aerea*, *pusilla*, *dimidiata*, *varians*.

SABAH 3 spp. *L. longiaristata*,* *globosa*, *nitida*.*

BRUNEI 5 spp. *L. coeruleifrons*, *submarginalis*, *globosa*, *dictenia*, *varians*.

SARAWAK 4 spp. *L. coeruleifrons*, *marginifrons*, *dictenia*, *dimidiata*.

- JAVA 11 spp. *S. javana*,* *L. coeruleifrons*,* *rugulosa*,* *nitida*, *aerea*, *bifurcata*, *marginifrons*, *globosa*, *dimidiata*, *fasciata*, *varians*.
 SUMATRA 8 spp. *S. javana*,* *L. nitida*,* *marginifrons*,* *globosa*, *dimidiata*,* *contracta*,* *fasciata*,* *varians*.
 Australian Region 9 spp.
 CELEBES 2 spp. *L. coeruleifrons*, sp. 3.
 LOMBOK 3 spp. *S. javana*, *L. coeruleifrons*, *varians*.
 CERAM 1 sp. *S. javana*.
 NEW GUINEA 1 sp. *S. javana*.
 SOLOMON 1 sp. *L. nana*.
 SAMOA 1 sp. *L. pallidifrons*.
 MICRONESIA 4 spp. *L. nana*,* *trukwana*,* sp. a,* sp. b.*
 Ethiopian Region 5 spp.
 KENYA 1 sp. *L. melania*.
 MADAGASCAR 4 spp. *L. sinuata*, *madagascarensis*, *divergens*, sp. 2.

Taxometric analysis

A simple method of taxometric analysis was applied to find the intergeneric and the interspecific relationships of the taxa. The species treated are 33 including 2 unnamed, all examined by myself (Table 2). The character analysed are 26, which are frequently used in conventional taxonomy of these taxa in question (Table 1). The three state coding is given to each character and the standardization of the character states is abbreviated. As a proximity analysis, SCD (sum of character differences) method is adopted because of no NC (no comparison) having been involved in the original data matrix (Table 2). The cluster analysis is made by UPGA (unweighted pair-group analysis using average linkage), and the calculation by a portable computer.

The phenogram (Fig. 56) resulted in showing the following sequences. The genera *Sphaerogastrella* and *Liodrosophila* are distinctly separated to form major clusters, 'a' and 'b', respectively. The picture winged species except *L. sinuata* compose an intimate cluster, 'f', to which two unusual species, *L. coeruleifrons* and *L. sp. 1* (cluster 'e'), are connected to form a major cluster, 'c'. Among another major cluster, 'd', of *Liodrosophila*, the species from Madagascar except *L. divergens* are clustered together (cluster 'k'), to which most of the species with 6 rows of acrostichal hairs including *L. divergens* (cluster 'l') are connected to form a major cluster, 'h'. The species with 2 rows of acrostichal hairs compose a compact cluster (cluster 'i'), which is separated from the cluster 'h'. *L. fasciata*, another unusual species, composes a distinct cluster, 'j', among the major cluster, 'd'.

Although Duda (1926 : 53) remarks that the number of rows of acrostichal hairs is to some extent variable individually, the present analysis indicates this character to be taxonomically useful.

Table 1. Characters used for taxometric analysis and their coding.

Characters		States		
		1	2	3
A	Eye	bare	intermediate	pubescent
B	Parafrontalia	broad	intermediate	narrow
C	Front	smooth	punctured or shrunk	granulose
D	Cheek	broad	intermediate	narrow
E	Second oral	as long as vibrissa	about 1/3 vibrissa	fine
F	Mesoscutum	smooth	punctured	pubescent
G	Scutellum	mat	velvety	granulose
H	Acrostichal hair rows	0	2, 4	6, 8
I	Scutellars	posteriors nearer anteriors	equidistant	posteriors nearer each other
J	Fore femur	yellow	brown	black
K	Hind femur	yellow	brown or distally black	black
L	R ₂₊₃	straight	intermediate	curved to costa
M	C-index	ca 1.0	ca 1.5	ca 2.0 or more
N	4V-index	ca 3.0	ca 2.0-2.5	ca 1.5
O	5x-index	ca 2.0	ca 1.5	ca 1.0
P	Ac-index	ca 5.0	ca 4.0	ca 3.5 or less
Q	3C fringe	1/3	1/2	2/3
R	Haltere	yellow	brown	black
S	Lower tip of epandrium	truncate	intermediate	pointed
T	Teeth row of ourotylus	concaved	straight	convexed
U	Aedeagus, shape	fusiform	slender	clawed or furcated
V	Aedeagus, vestiture	bare	intermediate	pubescent
W	Submedian spine of hypandrium	absent or minute	intermediate	very long
X	Ventral fragma	quadrate	rounded	triangular
Y	PI	ca 0.5	ca 1.5	ca 2.5
Z	Postverticals	present		absent
α	R ₄₊₅ and M	parallel	intermediate	divergent
β	Wing markings	absent		present

Table 2. Original

	A	B	C	D	E	F	G	H	I	J	K
<i>S. javana</i>	1	1	1	1	2	1	2	1	1	1	2
<i>S. rostralis</i>	1	1	2	1	1	1	3	1	1	1	1
<i>L. coeruleifrons</i>	3	1	3	2	3	3	1	2	3	3	3
<i>L. bimaculata</i>	3	3	3	1	3	3	2	3	2	2	1
<i>L. quadrimaculata</i>	2	1	3	1	3	3	3	2	2	2	1
<i>L. ornata</i>	2	1	3	1	2	2	1	2	3	3	2
<i>L. rugulosa</i>	3	3	3	2	2	3	2	3	3	3	2
<i>L. nitida</i>	2	3	1	2	2	1	2	3	3	3	2
<i>L. spinata</i>	1	2	1	3	2	1	1	3	2	3	2
<i>L. sinuata</i>	3	1	3	3	3	3	2	2	2	2	2
<i>L. madagascarensis</i>	3	1	1	3	3	2	2	3	2	3	2
<i>L. divergens</i>	3	1	1	3	3	2	2	3	2	1	2
<i>L. rufa</i>	3	1	2	3	1	1	2	3	2	2	2
<i>L. aerea</i>	3	2	1	2	3	2	2	3	2	2	1
<i>L. bicolor</i>	3	2	1	1	1	2	1	3	3	1	2
<i>L. castanea</i>	2	2	1	2	2	1	1	3	3	2	2
<i>L. ciliatipes</i>	1	2	1	2	1	3	3	3	2	1	2
<i>L. fuscata</i>	2	1	1	1	3	3	1	3	2	2	1
<i>L. fuscipennis</i>	1	1	1	1	1	1	2	3	2	2	1
<i>L. bifurcata</i>	2	2	1	2	1	2	2	3	2	3	3
<i>L. marginifrons</i>	3	1	3	2	1	2	2	2	3	3	2
<i>L. submarginalis</i>	2	1	2	1	1	2	2	2	2	3	2
<i>L. pusilla</i>	2	3	1	3	1	2	2	2	3	3	1
<i>L. globosa</i>	2	2	1	1	1	1	2	2	2	2	2
<i>L. ceylonica</i>	3	2	2	3	1	2	2	2	2	1	1
<i>L. dictenia</i>	3	2	1	2	1	3	2	2	2	3	2
<i>L. dimidiata</i>	3	3	1	2	1	3	2	2	2	3	2
<i>L. onchopyga</i>	2	1	1	2	1	2	2	2	2	1	1
<i>L. varians</i>	3	2	1	2	1	2	3	2	3	3	1
<i>L. sp. 1</i>	3	3	3	1	3	3	1	3	2	3	3
<i>L. sp. 2</i>	3	1	1	3	2	3	2	3	2	2	2
<i>L. sp. 3</i>	1	1	1	3	1	3	2	2	2	3	1
<i>L. fasciata</i>	3	3	1	3	3	2	2	2	1	3	3

data matrix.

L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	α	β
2	2	2	2	1	2	2	1	1	1	1	1	2	3	3	1	1
1	3	3	3	3	1	1	3	1	2	1	1	2	2	3	1	1
1	2	1	1	3	3	1	2	2	1	1	1	1	3	1	1	1
2	3	1	2	2	3	2	1	2	1	1	2	2	1	1	1	3
2	3	1	1	3	3	3	2	2	3	1	1	3	2	1	1	3
1	3	2	1	3	3	1	1	2	3	1	1	1	1	1	1	3
3	2	2	1	2	2	2	2	3	1	1	1	1	2	1	1	1
3	2	2	2	2	2	3	2	3	1	1	1	1	2	1	1	1
3	1	2	2	1	2	3	1	1	1	1	1	2	1	1	1	1
3	2	3	2	3	2	2	2	2	1	1	1	1	2	1	3	3
3	3	2	1	3	3	1	2	1	1	1	2	1	2	1	1	1
2	2	2	2	3	2	1	1	2	1	1	2	1	1	1	3	1
1	2	2	2	3	2	1	1	2	1	1	1	1	1	1	1	1
2	3	2	2	3	2	1	1	2	1	1	2	2	2	1	1	1
2	2	2	2	3	2	1	2	2	1	1	2	3	2	1	1	1
2	2	2	2	3	3	1	1	1	1	1	1	3	2	1	1	1
1	3	2	2	3	2	1	1	2	2	1	2	3	1	1	1	1
3	1	2	2	1	2	1	2	2	1	1	2	3	2	1	1	1
2	1	2	2	1	2	1	1	2	1	1	3	3	2	1	1	1
2	2	2	2	2	2	1	1	2	3	1	2	2	1	1	1	1
2	2	1	2	2	2	1	2	2	3	1	1	3	2	1	1	1
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1	2	1	2	3	3	3	1	3	1	1	1	2	3	1	1	1
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2	1	2	1	3	2	1	3	3	2	1	3	1	3	1	1	1
2	1	1	2	2	2	3	3	2	2	1	3	1	1	1	1	1

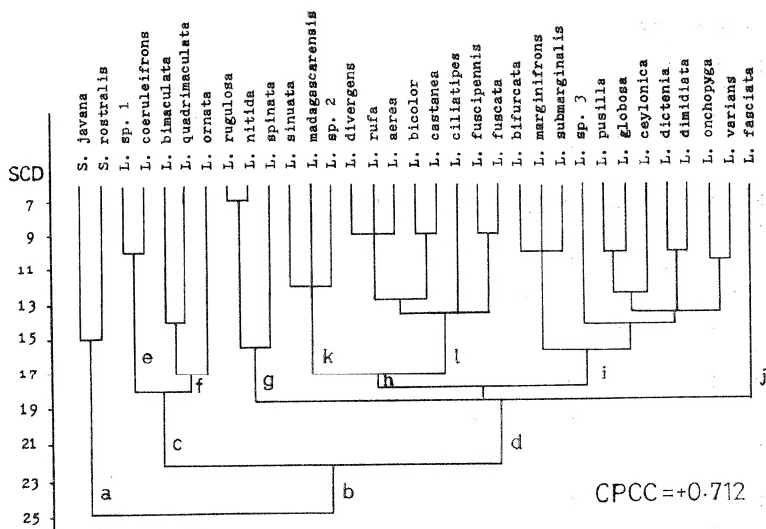


Fig. 56. A phenogram of the species of *Sphaerogastrella* and *Liodrosophila*, based upon SCD proximity analysis and UPGA cluster analysis. a-l. see in the text.

Key to genera and species

1. Postverticals, inner verticals, humerals, notopleurals, and acrostichal hairs absent. Abdomen much broader than thorax... *Sphaerogastrella*... 2
- Postverticals, inner verticals, humerals, and notopleurals present. Acrostichal hairs usually present. Abdomen usually not broader than thorax. *Liodrosophila*... 3
2. Scutellum velvety black. *S. javana*
- Scutellum granulose black. *S. rostralis*
3. Acrostichal hairs absent. *L. melania*
- Acrostichal hairs present. 4
4. Fore femur without a row of setulae inside. 5
- Fore femur with a row of setulae. 11
5. Acrostichal hairs in four rows. Abdominal tergites yellow with black caudal bands. *L. fasciata*
- Acrostichal hairs in six or more rows. Abdominal tergites brown or black. 6
6. Mesoscutum subshining brownish black, pollinose and granulose, C-index more than 1.5. *L. sp. 1*
- Mesoscutum glossy, not granulose. C-index less than 1.0 7
7. Mesoscutum light brown. Scutellum glossy light brown. Paramere as

- long as aedeagus. Scutellum glossy light brown. *L. pallidipennis*
- Mesoscutum dark brown to black. Scutellum velvety black. 8
8. Thoracic pleura unicolorous. 9
- Thoracic pleura not unicolorous. 10
9. Paramere as long as aedeagus. *L. nana*
- Paramere much shorter than aedeagus. *L. trukana*
10. Thoracic pleura dark on upper half, pale on lower half. *L. sp. a*
- Thoracic pleura tan, with a brown longitudinal stripe. *L. sp. b*
11. Abdominal tergites partially yellow. 12
- Abdominal tergites nearly entirely black. 13
12. Legs entirely yellow. Acrostichal hairs in 2 rows. Fifth abdominal tergite yellow, 6th with caudal black band. *L. contracta*
- Fore femur more or less brownish. Acrostichal hairs in 6 rows. First to 3rd abdominal tergites yellow. *L. madagascarensis*
13. Wing with black patches. 14
- Wing without black patches. 18
14. R_{2+3} strongly sinuated. Acrostichal hairs in 2 rows. *L. sinuata*
- R_{2+3} not sinuated. 15
15. Outer margin of wing dark. Acrostichal hairs in 2 rows. *L. ornata*
- Outer margin of wing pale. 16
16. Acrostichal hairs in 2 rows. Black spot of wing single, small, covering posterior crossvein. *L. longiaristata*
- Acrostichal hairs in 6 rows. Black spots of wing two or more, not covering posterior crossvein. 17
17. C-index about 1.8, R_{2+3} not acutely convexed at middle. Black patches of wing two. *L. bimaculata*
- Black spots of wing four, C-index about 2.5, R_{2+3} somewhat acutely convexed at middle. *L. quadrimaculata*
18. Acrostichal hairs in 2 or 4 rows. 19
- Acrostichal hairs in 6 or 8 rows. 29
19. Acrostichal hairs in 4 rows. Mesoscutum finely granulose. *L. varians*
- Acrostichal hairs in 2 rows. 20
20. Frontal shield much broader than long, subshining blue green. Male fore coxa vertically swollen medially. *L. coeruleifrons*
- Frontal shield nearly as broad as long, glossy brownish black. Male fore coxa normal. 21
21. Periorbit broad, not markedly narrowing anteriorly. 22
- Periorbit narrowing anteriorly. 27
22. Mesoscutum finely punctured, not pubescent. 23
- Mesoscutum pubescent, not punctured. 24
23. Anterior scutellars less than half as long as posteriors. *L. globosa*
- Anterior scutellars about 3/4 as long as posteriors. *L. onchopyga*
24. Periorbit reaching anterior margin of frontal shield. Aedeagus apparently bifurcated. Paramere unusually long. *L. marginifrons*
- Periorbit not reaching anterior margin of frontal shield. Aedeagus single. Paramere minute, fused to hypandrium. 25
25. Legs entirely yellowish brown. *L. submarginalis*

— Legs yellow, with fore and mid femora black.	26
26. Eye piled.	<i>L. dictenia</i>
— Eye bare.	<i>L. sp. 3</i>
27. C-index about 1.1.	<i>L. pusilla</i>
— C-index about 0.8.	28
28. Mesoscutum entirely black.	<i>L. ceylonica</i>
— Mesoscutum brownish, caudally black.	<i>L. dimidiata</i>
29. Front granulose and longitudinally shrinked.	<i>L. rugulosa</i>
— Front nearly or entirely smooth.	30
30. Fore femur yellow.	31
— Fore femur dark brown to black at least partially.	34
31. Fore tarsi without a row of long hairs dorsally.	<i>L. rufa</i>
— Fore tarsi with a row of long hairs dorsally.	32
32. R_{4+5} and M parallel.	<i>L. ciliatipes</i>
— R_{4+5} and M divergent.	33
33. Frontal shield as long as broad.	<i>L. divergens</i>
— Frontal shield longer than broad.	<i>L. sp. 2</i>
34. Mesoscutum pale brown or castaneous brown.	35
— Mesoscutum dark brown or black.	38
35. Mesoscutum unicolorous, pubescent.	<i>L. fuscata</i>
— Mesoscutum darker caudally.	36
36. Mesoscutum granulose.	<i>L. bicolor</i>
— Mesoscutum nearly or entirely smooth.	37
37. Mesoscutum nearly smooth.	<i>L. castanea</i>
— Mesoscutum entirely smooth.	<i>L. spinata</i>
38. Parafrontalia broad, not narrowing anteriorly.	<i>L. bifurcata</i>
— Parafrontalia much narrowing anteriorly.	39
39. Haltere dark brownish black.	<i>L. nitida</i>
— Haltere yellow.	40
40. Eye bare. Acrostichal hairs in 8 rows.	<i>D. fuscipennis</i>
— Eye with piles. Acrostichal hairs in 6 rows.	<i>L. aerea</i>

Summary

The descriptions of a species of *Sphaerogastrella* Duda and 13 species of *Liodrosophila* Duda from various countries of the Oriental Region and Madagascar, the redescrptions of some known species with newly obtained material, and a taxometric analysis of 33 species belonging to these two genera using actually examined specimens. The number of rows of acrostichal hairs is found to be one of the best supraspecific taxonomic characters for these groups.

Literature

Duda, O. 1922. *Liodrosophila* und *Sphaerogastrella*, zwei neue, zu den Drosophiliden und nicht zu den Camilliden gehörige Dipteren-Gattungen aus Südostasien. Arch. Naturg. 88A4: 150-160.

- Duda, O. 1926. Fauna sumatrensis, Drosophilidae (Dipt.). Supplta. Ent. 14: 42-116, 23 textfigs.
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Addendum

After submitted the final draft to the editor, I was able to borrow, through courtesy of Dr. László Papp, 18 *Liodrosophila* specimens of Sauter's Formosa expedition preserved at the Hungarian Natural History Museum, Budapest. They were labelled *dimidiata* (3 ex.), *nitida* (13 ex.), and *varians* (2 ex.), all identified by Duda. With kind permission of Dr. Papp, I have dissected the genitalia of some male specimens. The examination resulted in finding the followings.

L. dimidiata: 1 ♀, Kosempo (= Kuo-shing-pu*), XI. 1908, should really be *dimidiata*, while 1 ♂, 1 ♀, Polisha (= Puli*), XII. 1908, are identical with *globosa*, which has frontal shield narrower and periorbits broader than in *dimidiata*.

L. nitida: 3 ♂, 7 ♀, Polisha, XII. 1908; 1 ♀, Kosempo, VI. 1908; 1 ♀, Mt. Hoozan (Fon-fang-shan*), V. 1910; 1 ♀, Taihorin (Ta-ping-ling*), VII. 1911: all are identical with *aerea*. The species identified by me as *nitida* has much more smooth and glossy mesoscutum than in *aerea*, seemingly coincident with the original description of *nitida*.

L. varians: 1 ♂, 1 ♀ (the latter labelled "*varians*?"), Mt. Hoozan, V. 1910. The structures, especially of male genitalia, well agree with that of *aerea*. The species identified by me as *varians* has the acrostichal hairs distinctly in four rows and mesoscutum finely granulose.

The examination of types is required to reach the final decision.

* Names derived from Lin and Wheeler, 1972. Univ. Texas Publ. 7213: 238.